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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	
First Inventor or Application Identifier	J. T. LIN
Title	apparatus and method for the treatment of Diplopia using fiber-Coupled-Lasers
Express Mail Label No.	EL 219 557 042 98 Fed Exp

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

1. [X] * Fee Transmittal Form *(e.g., PTO/SB/17)* *(Submit an original and a duplicate for fee processing)*
2. [X] Specification [Total Pages 4] *(preferred arrangement set forth below)*
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) *(35 U.S.C. 113)* [Total Sheets 3]
4. Oath or Declaration [Total Pages]
   - a. [X] Newly executed (original or copy)
   - b. [ ] Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 16 completed)*
     - i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

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5. [ ] Microfiche Computer Program *(Appendix)*
6. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   - a. [ ] Computer Readable Copy
   - b. [ ] Paper Copy (identical to computer copy)
   - c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. [ ] Assignment Papers (cover sheet & document(s))
8. [ ] 37 C.F.R.§3.73(b) Statement *(when there is an assignee)* [ ] Power of Attorney
9. [ ] English Translation Document *(if applicable)*
10. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
11. [ ] Preliminary Amendment
12. [ ] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
13. [X] * Small Entity Statement(s) *(PTO/SB/09-12)* [ ] Statement filed in prior application, Status still proper and desired
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15. [ ] Other: .....

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[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: _____/_____

Prior application information: Examiner _____ *Group / Art Unit:* _____

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Name	J. T. LIN				
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Name (Print/Type)	J. T. LIN	Registration No. (Attorney/Agent)	
Signature		Date	Nov. 3, 2000

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TOTAL AMOUNT OF PAYMENT ($) 363.00

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	J. T. LIN
Examiner Name	
Group / Art Unit	
Attorney Docket No.	

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FEE CALCULATION

1. BASIC FILING FEE

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101	690	201	345	Utility filing fee	345
106	310	206	155	Design filing fee	
107	480	207	240	Plant filing fee	
108	690	208	345	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 345

2. EXTRA CLAIM FEES

	Extra Claims		Fee from below	Fee Paid
Total Claims	22 -20** =	2	X 9	= 18
Independent Claims	1 -3** =	0	X 0	= 0
Multiple Dependent			0	= 0

***or number previously paid, if greater; For Reissues, see below*

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	78	202	39	Independent claims in excess of 3
104	260	204	130	Multiple dependent claim, if not paid
109	78	209	39	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 18

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	380	216	190	Extension for reply within second month	
117	870	217	435	Extension for reply within third month	
118	1,360	218	680	Extension for reply within fourth month	
128	1,850	228	925	Extension for reply within fifth month	
119	300	219	150	Notice of Appeal	
120	300	220	150	Filing a brief in support of an appeal	
121	260	221	130	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,210	241	605	Petition to revive - unintentional	
142	1,210	242	605	Utility issue fee (or reissue)	
143	430	243	215	Design issue fee	
144	580	244	290	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	690	246	345	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	690	249	345	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) _____

Other fee (specify) _____

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SUBMITTED BY				Complete (if applicable)	
Name (Print/Type)	J. T. LIN	Registration No. (Attorney/Agent)		Telephone	407-482-4555
Signature				Date	NOV. 3, 2000

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PTO/SB/09 (12-97)
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STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(b))–INDEPENDENT INVENTOR

Docket Number (Optional)

Applicant, Patentee, or Identifier: J. T. LIN

Application or Patent No.:

Filed or Issued:

Title: Apparatus & methods for the Treatment of Presbyopia using fiber-Coupled Lasers

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- [X] the specification filed herewith with title as listed above.
- [ ] the application identified above.
- [ ] the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

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I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
J. T. LIN		
Signature of inventor	Signature of inventor	Signature of inventor
Nov. 3, 2000		
Date	Date	Date

APPARATUS AND METHODS FOR THE TREATMENT OF PRESBYOPIA USING FIBER-COUPLED-LASERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to methods and apparatus for the treatment of presbyopia using fiber-coupled lasers to ablate the sclera tissue.

2. Prior Art

Corneal reshaping including a procedure called photorefractive keratectomy (PRK) and a new procedure called laser assisted in situ keratomileusis, or laser intrastroma keratomileusis (LASIK) have been performed by lasers in the ultraviolet (UV) wavelength of (193 - 213) nm. The commercial UV refractive lasers include ArF excimer laser (at 193 nm) and other non-excimer, solid-state lasers such as those proposed by the present inventor in 1992 (US pat. no. 5,144,630) and in 1996 (US pat. No. 5,520,679). The above-described prior arts using lasers to reshape the corneal surface curvature, however, are limited to the corrections of myopia, hyperopia and astigmatism..

Refractive surgery using a scanning device and lasers in the mid-infrared (mid-IR) wavelength was first proposed by the present inventor in US Pat. No. 5,144,630 and 5,520,679 and later proposed by Telfair et. al., in US Pat. No. 5,782,822, where the generation of mid-IR wavelength of (2.5-3.2) microns were disclosed by various methods including: the Er:YAG laser (at 2.94 microns), the Raman-shifted solid state lasers (at 2.7-3.2 microns) and the optical parametric oscillation (OPO) lasers (at 2.7-3.2 microns).

Corneal reshaping may also be performed by laser thermal coagulation currently conducted by a Ho:YAG laser (at about 2 microns in wavelength) proposed by Sand in US Pat. 5,484,432. This method, however, was limited to low-diopter hyperopic corrections. Strictly speaking this prior art did not correction the true "presbyopia" and only performed the mono-vision for hyperopic patients. A thermal laser is required and the laser treated area was within the optical zone diameters of about 7 mm.

Ruiz in US pat. No. 5,533,997 proposed the use of laser ablation of cornea surface to correct presbyopic patients. This prior art, however, must generate multifocal (or bifocal) surface on the central portion of the cornea in order to achieve the desired presbyopia correction. Corneal curvature change by laser ablation in this prior art, however, did not

actually resolve the intrinsic problems of presbyopic patient caused by age where the cornea lens loss its accommodation as a result of loss of elasticity due to age.

All the above-described prior arts are using methods to change the cornea surface curvature either by tissue ablation (such as in UV laser) or by thermal shrinkage (such as in Ho:YAG laser) and all are using lasers onto the central potion of the cornea.

The alternative method for presbyopia correction, therefore, is to increase the accommodation of the presbyopic patients by change the intrinsic properties of the sclera and cililary tissue to increase the lens accommodation without changing the cornea curvature. This method of sclera ablation is fundamentally different from all the prior arts including that of Ruiz, in which reshaping cornea curvature into multifocal shape was required for presbyopia correction.

Correction of presbyopia via the expanding of the sclera by mechanical devices was recently proposed by Schachar in US patents 5,489,299 and 5,354,331. These prior arts all require the implant of external band or using laser heating to affect the position of the insertion band and have the drawbacks of complexity, time consuming, costly and potential for side effects. To treat presbyopia, Schachar's other US patents 5,529,076 and 5,722,952, proposed the use of heat or radiation on the corneal epithelium to arrest the growth of the crystalline lens by laser coagulation effects. However these two prior arts did not present any details or practical methods and there was no clinical studies have been practiced to show the effectiveness of the proposed concepts.

Roberto Albertazzi et al (Ocular Surgery News, July, 1999) recently proposed to use diamond knife for the incision of the sclera tissue outside the limbus rings to increase the space for sclera expansion. This method however caused corneal bleeding and regression is frequently found after the treatments. We note that there is intrinsic difference between a laser ablation proposed in this invention and the knife incision. The sclera space produced by the incision method is not permanent and may be greatly reduced during the tissue healing and cause the regression. This major source of regression in incision method however will not occur in the laser ablation method as proposed in this invention, where portion of the sclera tissue is permanently removed.

The "presbyopia" correction proposed by Ruitz (US Pat. No. 5,533,997) using an excimer (ArF) laser also required the corneal surface to be reshaped to form "multifocal" effort for a presbyopia patents to see near and far. However, Ruitz's "presbyopia" correction is fundamentally different from that of the present patent which does not change the corneal curvature. The presbyopia correction proposed in the present patent is to increase patient's

accommodation rather than reshaping the cornea into "multifocal" surface.

The technique used in the prior art of Bille (Pat. No. 4,907,586) required a quasi-continuous laser having pulse duration less than 10 picoseconds and focused spot less than 10 micron diameter and the laser is confined to the interior of a selected tissue to correct myopia, hyperopia or astigmatism. Bille also proposed the laser to focused into the lens of an eye to prevent presbyopia. This prior art system is very complicate and needs a precise control of the laser beam size and focusing position. Furthermore, clinical risk of cataract may occur when laser is applied into the lens area.

Treatment of presbyopia by cold lasers was recently proposed by the present inventor in US Pat. Application Nos. 09/189,609 and 09/391,503. These pending patents, however, require the use of a scanning device to generate the laser ablation patterns on the cornea. These systems therefore involve with complicated hardware and software for scanning patterns and patient centration or eye movement is critical.

Accordingly, there is a strong need to treat presbyopia via laser ablation of the sclera tissue using a laser system which may be delivered by a hand held fiber unit. Furthermore, the system may be used in either non-contact or contact modes with laser beam spot sizes defined by the size and shapes of the fiber tips. System proposed in the present patent will be safer than that of prior arts because the central portion of the cornea remains intact and only the area outside the limbus will be ablated by the laser. It is yet another objective of the present patent is to provide a no-invasive method where the conjunctiva layer may be lifted to generate the "gap" for fiber tip to insert into the gap and ablate the desired patterns underneath and to avoid or minimize bleeding or infection.

SUMMARY OF THE INVENTION

The preferred embodiments of the basic surgical lasers of the present invention shall include: (a) infrared (IR) lasers having wavelengths range of about (1.4 – 3.2) microns including but not limited to solid state lasers of Er:glass, Ho:YAG, Er:YAG, Er:YSGG, infrared gas lasers, solid-state lasers converted by optical parametric oscillation (OPO); (b) ultraviolet (UV) lasers having wavelength range of about (190 – 355) nm, such as ArF (at 193 nm) and XeCl (at 308 nm) excimer lasers and solid-state lasers using frequency conversions; (c) semiconductor diode lasers at about 980 nm, (1.3-1.55) microns, and (1.8-2.1) microns; (d) diode-pumped solid state lasers having wavelength range of about (190-355) nm and (2.7-3.2) microns such as diode-pumped Er:YSGG, Er:YAG, Nd:YAG, Er:glass and Ti:saphire laser and their harmonic generation.

It is yet another preferred embodiment is to couple the basic lasers by a fiber and deliver the laser beam to the treated area of the eye by a handheld piece which is further connected to a fiber-tip at various shapes.

It is yet another preferred embodiment to focus the laser beams into a desired spot size on the treated area of the eye. Various ablation patterns may be generated manually via the fiber-connected hand piece including multiple rings of spots and radial line incisions outside the limbus.

It is yet another preferred embodimentis to open the conjunctiva layer prior to the laser ablation of the under-layer of the sclera tissue for a better control of the ablation depth and for safety reasons. It is yet another preferred embodiment is that the conjunctiva layer may be lifted to generate the "gap" for fiber tip to insert into the gap and ablate the desired patterns underneath and to avoid or minimize bleeding or infection.

Further preferred embodiments of the present invention will become apparent from the description of the invention which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of the integrated laser system consisting of a laser, a coupling fiber delivery unit and a hand-piece connected to a fiber-tip to control the beam spot on the treated area.

FIG. 2 shows various shapes of the fiber tips: (A) flat tip, (B) spherical tip for focused contact use, (C) conical tip, (D) 90-degree angle tip, and (E) focused slit-spot.

FIG. 3 shows various ablation patterns generated by the ablating laser outside the limbus.

DETAILED DESCRIPTION OF THE INVENTION AND THE PREFERRED EMBODIMENTS

Referring to Fig. 1, a surgical laser system in accordance with the present invention comprises a basic laser 1 having wavelength 2 coupled by a focusing lens 3 to a fiber 4 which is connected to a hand-piece 5 and a fiber tip 6. The focusing lens 3, fiber 4 and fiber tip 6 are highly transparent to the wavelength 2 of the basic laser.

Still referring to Fig. 1, according to the present invention, the preferred embodiments of the basic surgical lasers for presbyopia correction procedures shall include: (a) infrared lasers having wavelengths range of about (1.4 – 3.2) microns including but not

limited to solid state lasers of Er:glass, Ho:YAG, Er:YAG, Er:YSGG, infrared gas lasers, solid-state lasers converted by optical parametric oscillation (OPO); (b) ultraviolet (UV) lasers having wavelength range of about (190 – 355) nm, such as ArF (at 193 nm) and XeCl (at 308 nm) excimer lasers and solid-state lasers using harmonic generation form solid-state lasers of Nd:YAG, Nd:YLF and Alexandrite lasers frequency conversions; (c) semiconductor diode lasers at about 980 nm, (1.3-1.55) microns, and (1.8-2.1) microns; (d) diode-pumped solid state lasers having wavelength range of about (190-355) nm and (2.7-3.2) microns such as diode-pumped Er:YSGG, Er:YAG, Nd:YAG and Er:glass. and; (e) diode lasers having wavelength at about 980 nm, 1.5 microns, and 1.9 microns.

According to one aspect of the present invention, the preferable scanning laser energy per pulse on corneal surface is about (2-20) mJ in IR lasers and about (0.5 – 2.0) mJ in UV lasers. Focused spot size of about (0.1-0.5) mm in diameter on the corneal plane is achieved by the focusing lens 3 which consists of at least one spherical lens. The other preferred laser parameter of this invention is the laser repetition rate range of about (5-100) Hz which will provide reasonable surgical speed and minimum thermal effects. The focused beam may be scanned over the corneal surface to ablate various patterns to achieve the desired sclera expansion.

Referring to Fig. 2(A), the laser output from the fiber end having wavelength 2 is connected to the hand-piece 5 and a flat fiber tip 6 such that the output laser beam from the end of the fiber tip is a round-beam with a pre-determined spot size of about (0.1.0.5) mm. Fig. 2(B) shows similar structure to Fig. 2(A) , except the output round-spot beam is re-focused by th spherical shape of the tip. Fig. 3 (C) shows the output beam 2 is guided by a conical shape tip such that the beam size at the end of the tip is reduced. Fig. 2(D) shows that the output beam is reflected by 90-degree by a coated fiber tip. Finally Fig. 2(E) shows an output beam spot is a slit-shape having a size of about (0.1-0.5) x (1.5-3.0) mm formed by a cylinder lens attached to the end of the fiber tip.

Fig. 3 shows an eye 7 of a presbyopic patient with ablation patterns 9 generated on the scleral area about (0.5-1.0) mm posterior to the corneal limbus 8. The preferred patterns of this invention include a ring-spot having at least one ring with at least 3 spots in each ring, and a radial-pattern having at least 3 radials. The preferred area of the ablation is defined within two circles having diameters about 10 mm and 14 mm posterior to the limbus along the radial direction of the cornea. We should note that a radial ablation pattern on the corneal surface may be generated either by an automatic scanning device or by manually scan the fiber tip by a surgeon who hold the hand piece. For the situation of the slit fiber-tip, the

surgeon may easily generate the radial patterns without moving the tip.

The ablation depth of the sclera ciliary tissue is about (400-700) microns with each of the radial length of about (2.5 - 4.0) mm adjustable according to the optimal clinical outcomes including minimum regression and maximum accommodation for the presbyopic patients. The preferred radial ablation shall start at a distance about (4.0 – 5.5) mm from the corneal center and extended about (2.0-4.0) mm outside the limbus. The preferred embodiments of the radial patterns on the sclera area include at least 3 radial lines or ring-dots in a symmetric geometry as shown in Fig. 3.

Still referring to Fig. 3, the preferred embodiments to generate the radial patterns on the sclera area include the following examples. (A) Scan the round laser spot of about (0.2- 0.5) mm in diameter produced from the fiber tips in the radial directions to generate each of the radial lines. Generation of the radial pattens may be done either manually moving the fiber tip along the cornea radial direction or by an automatically a scanner or translator. (B) Use a focused slit-beam to generate the radial lines. In case (B), a scanning device is not needed and each of the radial lines may be generated by the slit beam directly.

One preferred embodiment is to coagulate the conjunctiva layer and then cut (by a knife) a half-circle over the conjunctiva surrounding the limbus with a diameter about 10 mm which is then pushed aside in order for the ablating laser to cut the sclera layer underneath. It is also possible to use the ablating laser to cut the conjunctiva layer which however may take a longer time than cutting by a knife. Another preferred embodiment is not to open the conjunctiva layer, but to insert the fiber tip through the conjunctiva layer and ablate the sclera tissue underneath such that the procedure is done non-invasively. To do this procedure, the conjunctiva layer may be lifted to generate the "gap" for fiber tip to insert into the gap and ablate the desired patterns underneath. Additional advantages of this invasive method is to avoid or minimize bleeding or infection. We note that most of the bleeding is due to cutting of the conjunctiva tissue rather than the laser ablation of the sclera tissue.

While the invention has been shown and described with reference to the preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes and variations in form and detail may be made therein without departing from the spirit, scope and teaching of the invention. Accordingly, threshold and apparatus, the ophthalmic applications herein disclosed are to be considered merely as illustrative and the invention is to be limited only as set forth in the claims.

CLAIMS:

I claim:

1. A system, adaptable for performing presbyopic correction in which a portion of the corneal sclera tissue is removed by steps of :

(a) selecting a laser beam having a predetermined wavelength ;

(b) selecting a beam spot controller mechanism, said beam spot controller to reduce and focus said laser beam to a fiber delivery unit;

(c) controlling the said fiber delivery unit to deliver said laser beam in a said predetermined pattern onto a plurality of positions on the corneal surface to remove portion of the sclera tissue outside the limbus area, whereby a presbyopic patient's vision is corrected to see near and far by increasing the accommodation of the lens.

2. .A system as claimed in claim 1, wherein said laser beam is an ultraviolet laser having a wavelength range of about (0.15 - 0.36) microns and a pulse duration less than about 200 nenoseconds.

3. A system as claimed in claim 1, wherein said laser beam is an infrared laser having a wavelength range of about (1.4 - 3.2) microns.

4. A system as claimed in claim 2, wherein infrared laser is an optically pumped Erbium:YAG laser having a wavelength of about 2.9 microns.

5. A system as claimed in claim 1, wherein said laser beam is an ArF excimer laser having a wavelength of 193 nm.

6. A system as claimed in claim 1, wherein said laser beam is a XeCl excimer laser having a wavelength of 308 nm.

7. A system as claimed in claim 1, wherein said laser beam is a solid state diode laser having a wavelength range of about (0.95 – 2.1) microns.

8. A system as claimed in claim 1, in which said beam spot controller consists of at least one focusing spherical lens to couple the said laser beam to the said fiber delivery unit.

9. A system as claimed in claim 1, wherein said fiber delivery unit consists of an optical fiber having a length of about (0.5 - 1.5) meter and core diameter of about (0.2 - 0.8) mm and a hand piece connected to a fiber tip.

10. The apparatus of claim 9, wherein said fiber delivery unit is substantially transparent to the wavelength of the said laser beam.

11. The apparatus of claim 9, wherein said fiber tip is made of a similar material as that of the fiber and is made in one of the following shapes to focus the said laser beam onto the treated sclera area of the eye: conical, spherical, 90-degree reflecting angle and flat end.

12. The apparatus of claim 9, wherein said fiber tip focuses the said laser beam onto the treated area of the eye at a spot size of about (0.1 - 0.5) mm in diameter.

13. The apparatus of claim 9, wherein said fiber tip is made in a cylinder shape to focus the said laser beam onto the treated area of the eye at a line shape having a dimension of about (0.1 - 0.4) in width and (0.5 - 4.0) mm in length.

14. The apparatus of claim 9, wherein said fiber tip is operated in a contact-mode to ablate the sclera tissue to a depth of about (300 - 800) microns.

15. The apparatus of claim 9, wherein said fiber tip is operated in a non-contact mode to ablate the sclera tissue to a depth of about (300 - 800) microns.

16. The apparatus of claim 1, wherein said fiber delivery unit is controlled by the surgeon to perform a predetermined patterns outside the limbus of the cornea by manually moving the fiber tip in the radial direction of the cornea.

17. A system as claimed in claim 1, wherein said fiber delivery unit is attached to a scanning device to perform said predetermined patterns outside the limbus of the cornea and scan said laser beam along the radial direction of the cornea.

18. A system as claimed in claim 1, wherein said predetermined patterns outside the limbus of the cornea defined by the area between two circles having radius of about 5.0 mm and 9.0 mm, respectively.

19. A system as claimed in claim 1, wherein said predetermined pattern includes at least 3 radial lines around the area outside the corneal limbus.

20. A system as claimed in claim 1, wherein said predetermined pattern includes at least two rings formed by 8 circular spots having a diameter of about (0.2 - 0.5) mm around the area outside the corneal limbus.

12.A system as claimed in claim 1, wherein said sclera tissue is removed by said laser beam after the cornea conjunctiva is open.

22. A system as claimed in claim 1, wherein said sclera tissue is removed by said laser beam without opening the cornea conjunctiva.

ABSTRACT

Systems and surgical techniques for presbyopia correction by laser removal of the sclera tissue are disclosed. The disclosed preferred embodiments of the system consists of a beam spot controller, a fiber delivery unit and a fiber tip. The basic laser including UV lasers and infrared lasers having wavelength ranges of (0.15-0.36) microns and (1.9-3.2) microns and diode lasers of about 0.98, 1.5 and 1.9 microns. Presbyopia is treated by a system which uses an ablative laser to ablate the sclera tissue outside the limbus to increase the accommodation of the ciliary body of the eye. The sclera tissue may be ablated by the laser with or without the conjunctiva layer open.

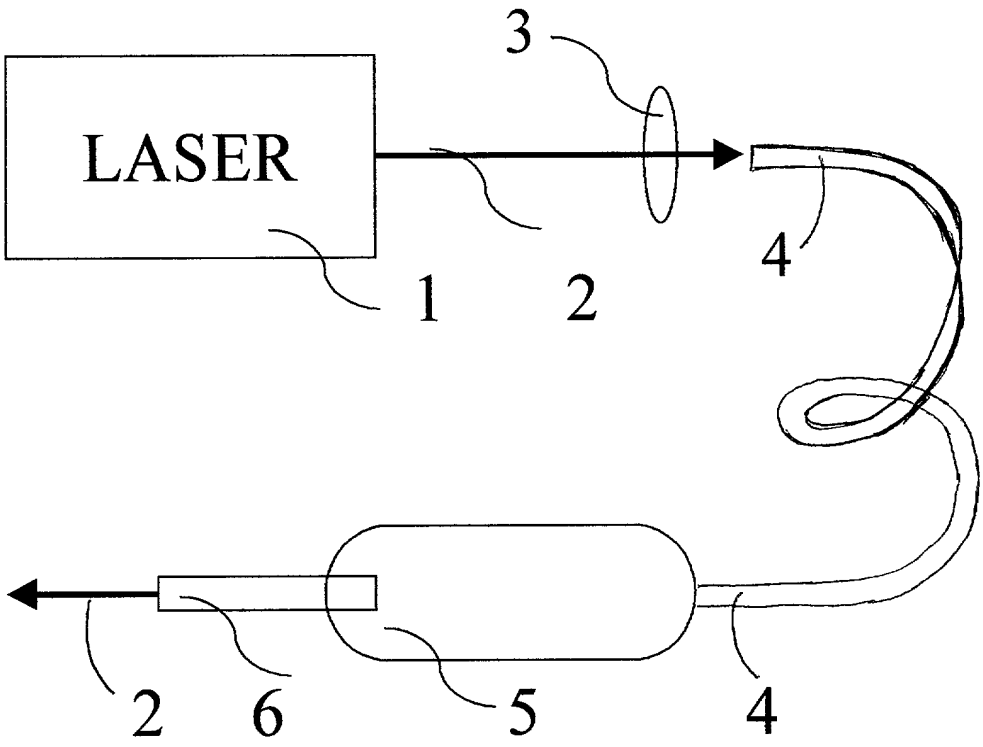

FIG. 1

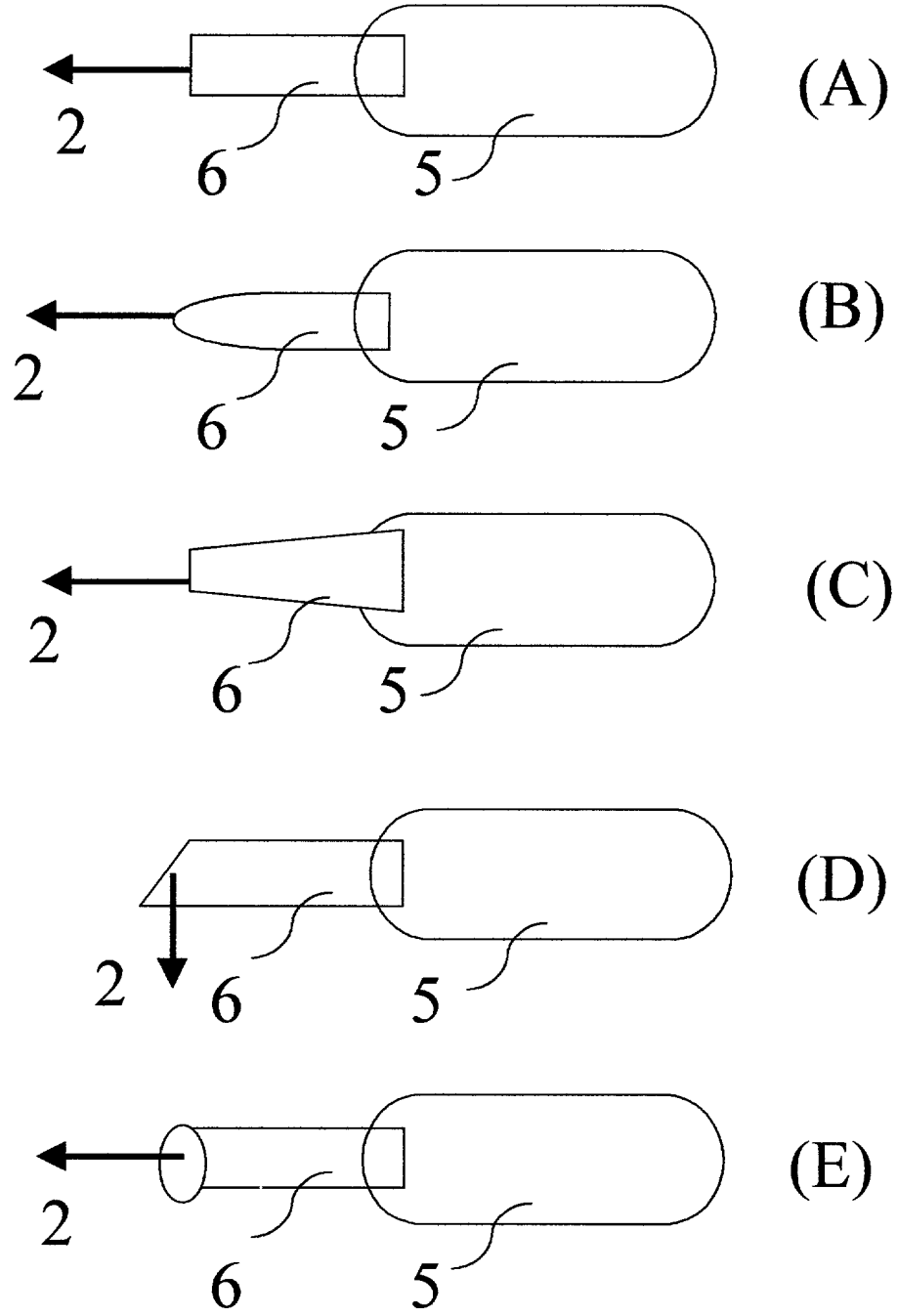

FIG. 2

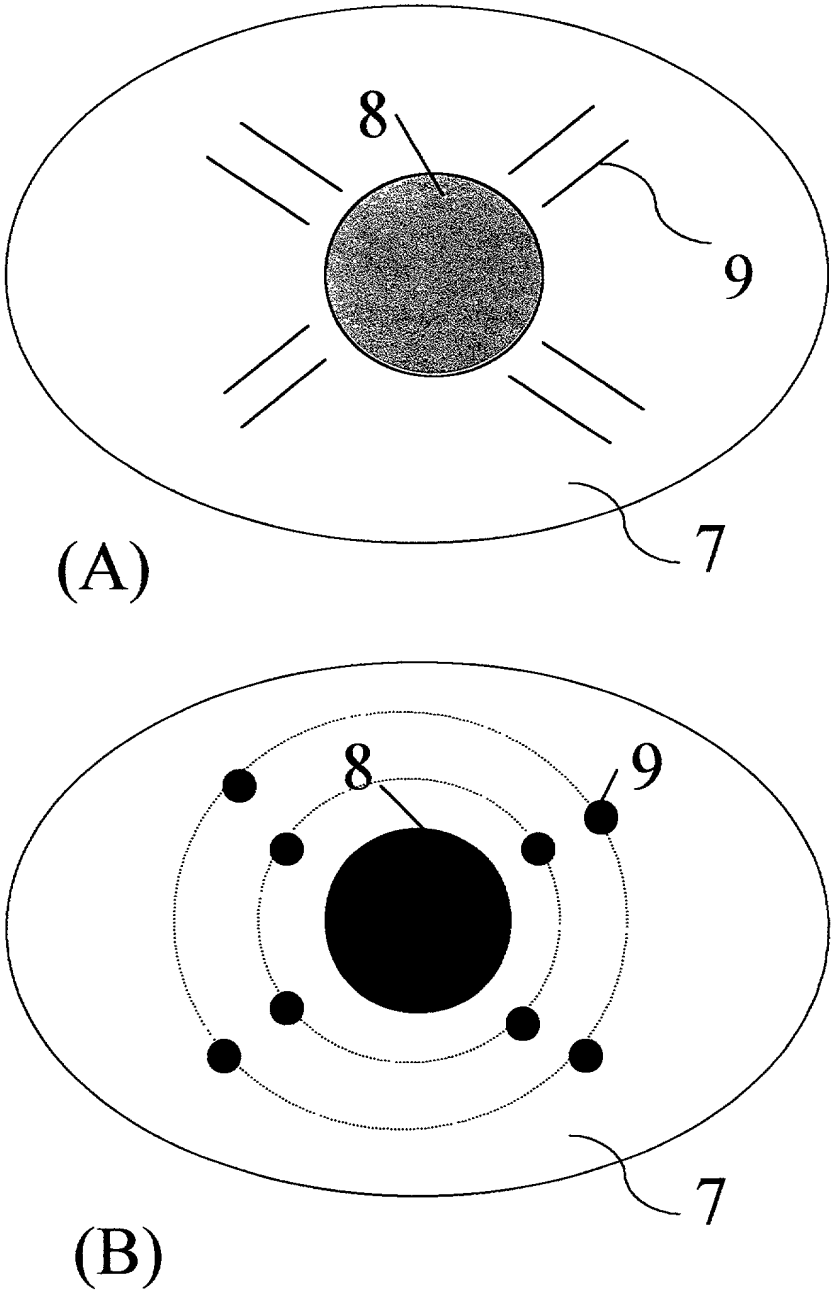

FIG. 3

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☒ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	
First Named Inventor	J. T. LIN
COMPLETE IF KNOWN	
Application Number	/
Filing Date	
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Apparatus & Method for the Treatment of Presbyopia using fiber-coupled-lasers.

(Title of the Invention)

the specification of which

☒ is attached hereto
OR
☐ was filed on (MM/DD/YYYY) ____ as United States Application Number or PCT International Application Number ____ and was amended on (MM/DD/YYYY) ____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

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Application Number(s)	Filing Date (MM/DD/YYYY)

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I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number *(if applicable)*

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
J. T.	LIN

Inventor's Signature						Date	11/3/00
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Post Office Address	4532 Old Carriage Trail						
Post Office Address							
City	Oviedo	State	FL	ZIP	32765	Country	USA

☐ Additional inventors are being named on the ____ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto